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ABSTRACT

School ponds have a considerable history and in recent years have become a common feature of school grounds, particularly in the primary sector. Relatively little is known about their status and effectiveness educationally and in terms of their conservation value. This paper reports the findings of a survey involving 46 schools in 10 different Local Education Authorities (LEAs). The findings show that factors constraining schools from developing ponds, the ways in which they have come about and are managed and used, vary markedly between primary and secondary schools. The design, maintenance and amenity value of school ponds result in a number of compromises. These may be problematic in terms of conservation value but have to be resolved in an educational setting. (Contains 18 references.) (Author/ASK)

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School ponds : their current status and likely contribution to education, conservation and local environmental enhancement

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Abstract

School ponds have a considerable history and in recent years have become a common feature of school grounds, particularly in the primary sector. Relatively little is known about their status and effectiveness educationally and in terms of conservation value.

This paper reports the findings of a survey involving 46 schools in ten different Local Education Authorities (LEAs). The findings show that factors constraining schools from developing ponds, the ways in which they have come about and are managed and used, vary markedly between primary and secondary schools.

The design, maintenance and amenity value of school ponds result in a number of compromises. These may be problematic in terms of conservation value but have to be resolved in an educational setting.

Introduction

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The emphasis on school ground use in the first half of this century was purely for recreation and games (Board of Education, 1933). Since the early 1950s, however, there has been a steady shift away from this position to encompass more aesthetic and environmental aspects. School building bulletins produced by the Department for Education and Science (DES) for example recommended that children should ... "have small private gardens, perhaps a pond, perhaps some accommodation for animals" (DES, 1955). Children themselves have also been found to value bodies of water in the design of their school's environment (Manchester Polytechnic, 1977).

Over the last twenty years the growth in school ponds has been accelerated by a number of influences; the increasing ecological content of examination syllabuses, the introduction of a National Curriculum in England and Wales, promotion of school grounds development by LEAs and bodies awarding grants for the development of school grounds (e.g English Nature, Groundwork Trust etc.). This growth has coincided with a marked decline in the number of ponds found in the natural environment - a rate estimated at 2% per annum (Oldham and Swann, 1994). The recent increase in school ponds is paralleled by an even greater one for garden ponds and these are seen by some as making an important contribution to the conservation of freshwater habitats in urban areas, particularly for

amphibian populations (Latham, 1995). In this way school ponds form part of a crucial network of freshwater sites that enhance local environments. This is particularly true where schools have been built on previous farmland and in central urban areas of high density building where ponds are rarer.

Whilst there is much published advice on the building of school ponds (see for example, Brooks and Agate, 1997; Sansom, 1993; Kersey, 1997) there has been little published research into the effectiveness of school ponds in terms of conservation, educational use and maintenance. Evaluations have been carried out at a local level (e.g. Kirklees, 1995) but these have usually formed the basis of reports to the funding body to highlight 'success rates' or 'value for money'. The purpose of the research described in this paper is to fill a gap and act as the first stage in a national project raising the profile of school ponds as an educational resource and advising schools, governing bodies and other interested parties as to their best use.

The survey and its main findings

The scope and design of the survey

A questionnaire was designed to elicit information from a wide variety of schools in both the primary and secondary sectors. Bretton Hall College has links with schools, via its school partnership schemes, in ten LEAs across the Yorkshire region. Sixty-four primary schools were chosen on the basis of those hosting second year undergraduate students on teaching practice. Students left the questionnaires with the school for return to the College. A similar number of secondary schools in the partnership scheme were sent the questionnaire by post.

The questionnaire was divided into four sections. Questions were based mainly on a limited range of options and followed best advice on design in terms of validity, readability and avoidance of ambiguity (Oppenheim, 1992). The first section asked for basic background information on school location and size and the age of any pond. Questions in the following section probed the development and maintenance of the pond and the frequency of its use by different groups of children. The third section asked for a limited amount of physical and biotic data. The final section was designed for those schools who did not have ponds with the intention of measuring the relative importance of factors preventing construction.

Response rates and numbers of ponds

Just over one third of the schools contacted replied and although this is less than was hoped for it is acceptable in the context of the exploratory phase of the project. Response rates were similar in both primary and secondary sectors.

A high proportion of all schools (65%) reported having ponds; 56% of primary schools and 74% of secondary schools. This is almost certainly not representative of schools in general and probably biased by the fact that schools with successful ponds or those having

problems with them wanted to inform the project. This was particularly true for secondary schools.

Types, ages and sizes of ponds

Most school ponds were purpose built and often planned as part of a wildlife area containing a variety of habitats (e.g meadow, copse, habitat/log piles). A few ponds were built as part of the original construction or extension to a school. These are often ornamental features. One secondary school reported sharing a large natural pond as part of a co-managed wetland reserve.

As predicted from recent trends, school ponds are relatively recent, over 80% being less than 15 years old. Some are very recent, less than two years old and these are likely to be replacements for vandalised or leaking ponds, built in addition to existing features or are the result of recently funded projects.

Pond sizes are on the small side, 70% being less than 20m². The range of sizes however is very large from small oval, garden sized ponds of 2m² or less to larger constructions of over 150m². The largest ponds tend to be in secondary schools where space is not at such a premium. Most ponds are rarely over 1 metre in depth (mean maximum depth is 86cm.). The shallowest ponds are around 30cm deep.

Factors constraining the development of school ponds

Schools without ponds were encouraged to reply to the questionnaire so that the potential for further use of the resource could be gauged and restricting factors examined.

Virtually all schools who replied but do not currently have ponds said that they wanted one. The factors that had highest priority in terms of constraints in the minds of respondents (scored 1 or 2 on a 1-5 scale) are displayed as table 1 below:

Table 1 Factors constraining schools from building ponds

Percentage of schools giving each factor high priority			
	All schools n = 17	Primary schools n = 10	Secondary schools n = 7
Cost	71	90	43
Maintenance	41	40	43
Vandalism	59	40	86
Lack of expertise	18	20	14
Space	6	10	0

It appears that cost is a major concern for schools especially for those in the primary sector. Maintenance is a problem for all schools and vandalism features strongly particularly in secondary schools.

The development, use and management of school ponds

Development and construction

Schools with ponds were asked to indicate sources of support and funding and also indicate if development was part of an overall plan. The results of this section of the survey are reported as table 2 shown below:

Table 2 Assistance and planning for the construction of school ponds

	All schools (%) n = 30	Primary schools (%) n = 13	Secondary schools (%) n = 17
Part of wildlife plan	46	38	53
Community group	16	23	12
LEA	10	15	6
Special grant	37	38	35
Parents	27	46	12
Children	63	62	65

Schools made good use of children particularly at the planning stage but parental involvement was much higher in the primary schools. It is perhaps surprising that few schools mentioned LEA involvement since at the very least planning departments must be consulted to check location of underground services and safety. Respondents may have been cued here to think that 'involvement' applied more to the active phases of construction, planting and aftercare than to planning and design.

Educational use

Schools were asked to say how intensively they used their ponds with different age groups during the year. Primary schools seemed to use their ponds more equitably across year groups. Half the schools said that all classes in a year group used the pond at some stage in the year compared with only 18% in secondary schools. Year round study featured in a quarter of primary school but in only 6% of secondary school use. It seems that one or two teachers are more likely to use the resource in secondary schools and that this may be related to the demands of a particular examination syllabus.

Maintenance

Most ponds are managed to clear plants and maintain a mid- successional status by action at least once a year. About one third of schools reported managing their ponds on a more regular basis most often under the supervision of an enthusiastic teacher or parent or by the caretaker. Surprisingly few schools seemed to use children to assist in maintenance with the notable exception of four schools who reported the formation of wildlife/conservation 'action groups' to carry out this and other work in the school grounds.

Pond populations

Although schools were asked a number of questions as to the species present in their ponds, information is rather scant. This is primarily due to the lack of survey information retained from class use and/or problems with the knowledge base of teachers in this area particularly in the primary schools. Some interesting information regarding amphibian populations, however, has emerged.

Amphibians in school ponds

Nearly three quarters of schools with ponds reported having resident amphibian populations. The common frog (*Rana temporaria*) was reported in 70% of ponds and 'newts' (*Triturus sp.*) in 33%. One school reported the presence of the palmate newt (*Triturus helveticus*) although individuals may have been confused here with females of the smooth newt (*Triturus vulgaris*) as identification is notoriously difficult for non-experts (Latham, 1995). A school with shared use of a large adjacent pond as part of a wetland conservation scheme reported the presence of the great crested newt (*Triturus cristatus*).

Discussion of the findings and implications for more effective use of school ponds

The design of a school pond must consider a number of factors. These include; optimising wildlife potential and species diversity, amenity for data collection/pond dipping, safety and security and overall land use within the context of the school's locality, the nature and extent of its grounds and intended or past development. The consequent compromises mean that thorough planning and a good understanding of the features of effective design are prerequisites for success. There is evidence to show that developments fail where there is poor design and/or a lack of appreciation of the pond as a transient habitat undergoing continual succession (Kirklees, *op. cit.* p 34-5).

The siting of ponds

Ponds are more likely to attract a greater diversity of invertebrate fauna and support amphibian populations where they are within semi-natural environments and close to woodland, copse or other vegetation (Latham, *op. cit.* p28, Pond Action, 1994). The siting of ponds within wildlife areas helps in this respect but these are still likely to be isolated from more substantial areas of vegetation. Some ponds have to be sited away from field margins

and boundaries because of security and safety. Having a pond next to the school may make it more secure but less interesting in terms of faunal diversity. There is also the problem that if the pond is surrounded by a wildlife area in this situation it makes the aspect of the school look untidy. This has previously been reported as a worry by some schools (Adams, 1990).

Size, depth and open water

Although ponds tend to be small, this may not be a problem in terms of richness for study. There is evidence to show that small ponds are just as diverse as large ones (Biggs *et. al*, 1994). Maintaining the necessary degree of open water and access for pond dipping poses some interesting problems for designers.

The usual activity for children to carry out in school pond studies is to use relatively small nets and to reach out into accessible water to sweep for animals. Where ponds follow conventional design with sloping sides from shallower margins this can cause problems particularly in summer months when water has evaporated and the water edge is too far from the dipping position. One suggestion (Kersey, *op. cit.* p2) is to plan for slightly deeper water (to a maximum depth of 40cm) planted with submerged plants at the edge of a dipping platform with a retaining board or rail so that children can reach safely to obtain sufficiently rich samples. The main marginal vegetation is then planted to a sloping edge adjacent or opposite the amenity.

Most recommendations on safety suggest maximum pond depths of 75-100cm (Bunyan, 1988, Brooks and Agate *op. cit.* p 48) and this is consistent with the findings quoted in this paper. There is value in having some deeper water as it allows for a refuge of unfrozen water in the severest winters and it is less likely that the pond will dry out completely in summer months although this may not be disastrous for many species (Pond Action, 1994).

Problems of security and vandalism

Damage to ponds through vandalism was a concern of many schools in the survey particularly secondary schools in central or peripheral urban situations. The most common damage is to pond liners soon after construction. Some advisers recommend a 'belt and braces' approach using a liner protected by a concrete armater (Brooks and Agate, *op.cit.* p 56-9). Such an approach is very costly and as the findings show this is the most sensitive aspect for most schools. A cheaper solution is to lay a tough polyethylene matting over the liner and to ensure that this is secured and the pond filled in one session. The matting has the advantage that it cannot be cut with a sharp knife and that algal growth and plant rooting is swift therefore making it look natural within a short space of time.

One common source of attack is from rocks and other objects thrown into the pond which then puncture the lining. Simply removing rocks and debris from the site can do much to minimise this. Many schools have had problems with stone or concrete slabs laid to edge the pond or provide dipping platforms being thrown in soon after construction . These materials are therefore best avoided.

Maintenance - the management of vegetation

Survey findings show that maintenance continues to be a major problem for schools. Research carried out on behalf of Kirklees Local Education Authority (Kirklees, *op. cit.* p32-3) shows that whilst half of all schools engaging in grounds development included ponds they were seen as more problematic than any other habitat/area of development.

Schools are usually happy with ponds for about two years or so and indeed colonisation during this time is known to be relatively fast with most species likely to colonize present in this time and maximum diversity achieved five years from construction (Williams *et.al.*, 1997).

The main problem for schools is the need to maintain the pond's amenity value for educational study and this inevitably requires management on a more regular basis than staff realise. The relatively small size of school ponds exacerbates the situation particularly where vigorous plants such as common reedmace (*Typha latifolia*) and Unbranched bur-reed (*Sparganium simplex*) are present. Some schools buying plants from non-wildlife specialists or 'on the cheap' may have inadvertently introduced highly invasive alien species such as New Zealand Pygmyweed (*Crassula helmsii*). Good advice on suitable plants and reliable sources for these are given in a number of publications (see for example; Drake, Brooks and Agate, Kersey, *op. cit.*).

Most schools in the survey reported that they managed their ponds only yearly or in response to 'crises'. A more regular and gentle regime may be more beneficial to the pond ecosystem as more drastic intervention is likely to lead to greater time for recovery or excessive removal of sites for invertebrates (Drake *et. al. op. cit.* p 10-11).

Educational use

Some educators see satisfactory ecological understanding requiring study of ecosystems at all seasons (Tansley, 1987). The survey indicates that such studies at school ponds are rare particularly in the secondary schools yet arguably this is where the sophistication of knowledge and understanding required is greatest. The concentration of pond studies in summer months means intensive dipping by many classes over a short period of time and this may have consequences for the recovery of invertebrate populations particularly in small ponds. Kersey (*op. cit.*) for example recommends that an area equivalent to at least one third of the pond is left undipped to allow for recovery and recolonisation in undisturbed areas.

Environmental education represents a much broader curriculum area than the study of ecology alone. The National Curriculum Council for example has recognised three basic aspects :

- Education ABOUT the environment
- Education THROUGH the environment
- Education FOR the environment

(NCC, 1990 p7)

The last of these can best be achieved through the involvement of pupils in enhancement and maintenance of their own environment. It is perhaps surprising therefore that few schools involve children very directly or actively in the continued development and maintenance of their outside resources.

Conclusion

The research reported here shows that school ponds continue to be a popular resource for educational study and a first choice for many in the context of school grounds development. Schools that do not have ponds would like them but cost, vandalism and maintenance are real constraints. The difficult compromises necessary when designing and constructing school ponds result in choices that may not always benefit users or the pond ecosystem itself. More work remains to be done on the ways in which the intensity of pond dipping, siting, size and depth characteristics affect environmental quality of ponds.

School ponds may not make a major contribution in terms of locally or nationally rare species although detailed ecological assays are required to see if this is true. They are probably significant in terms of amphibian populations and contribute to the overall mosaic of ponds including the increasing number flourishing in local gardens. They therefore make a valuable contribution to the richness of freshwater sites particularly in depleted urban areas.

Ponds remain an increasingly useful resource for the education of children although schools could do more to manage and use the resource more effectively and involve children and the community in their conservation.

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